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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/783,761	02/20/2004	Sungdo Moon	200313044-1	7412

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EXAMINER

WANG, BEN C

ART UNIT PAPER NUMBER

2192

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/22/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

## Office Action Summary

Application No.

10/783,761

Applicant(s)

MOON ET AL.

Examiner

Ben C. Wang

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 20 February 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

### DETAILED ACTION

1. Claims 1-20 are pending in this application and presented for examination.

#### ***Claim Rejections – 35 USC § 102(b)***

2. The following is a quotation of 35 U.S.C. 102(b) which forms the basis for all obviousness rejections set forth in this office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-20 are rejected under 35 U.S.C. 102(b) as being unpatentable over Ayers et al. (hereafter 'Ayers') (Aggressive Inlining, 1997, ACM).

4. **As to claim 1**, Ayers discloses a method for cross-module in-lining (Sec. 1, 4<sup>th</sup> Para., Lines 7-9), comprising:

In a first phase of a compiling process, deciding to in-line a first function in a first module into a second function in a second module (Fig. 4 - screen inline candidates & select inline sites; Sec. 2.4, 3<sup>rd</sup> Para., Lines 1-2, 5-17); providing the location of the first function (Sec. 2.4, 1<sup>st</sup> Para, Lines 1-2; Sec. 2.3, 6<sup>th</sup> Para., Lines 7-13 – the address of a file-static procedure); providing instructions for in-lining to be performed in a second phase of the compiling process (Sec. 2.2, 1<sup>st</sup> Para., Lines 1-4, 6-9; Sec. 2.1, 1<sup>st</sup> Para., Lines 4-8);

In the second phase of the compiling process, following the instructions to in-line code of the first function into the second function (Sec. 2.2, 1<sup>st</sup> Para., Lines 9-12).

5. **As to claim 10**, Ayers discloses a method for compiling a first set of modules having programming source code (Fig 1 (bottom), element – Sources), comprising:

In a first phase (Fig. 1 (bottom), elements - Sources, Front End), from the first set of modules, providing a second set of modules having first intermediate representations (Sec. 2.1, 1<sup>st</sup> Para., Lines 1-4);

In a second phase (Fig. 1 (bottom), element - Inter-procedural Optimization), performing in-line analysis on the second set of modules (Sec. 2.2, 1<sup>st</sup> Para., Lines 6-8); providing instructions for in-lining to be performed in a third phase of the compiling process (Sec. 2.2, 1<sup>st</sup> Para., Lines 9-12); and providing a third set of modules having second intermediate representations optimized (Sec. 1, 4<sup>th</sup> Para., Lines 1-3; Sec. 2.2, 1<sup>st</sup> Para., Lines 1-6, 2<sup>nd</sup> Para.) from the first intermediate representations (Sec. 2.2, 1<sup>st</sup> Para., Lines 9-12 - ucode);

In the third phase of the compiling process (Fig. 1 (bottom), element - Per-Routine Optimization), following the instructions to perform in-lining (Sec. 2.2, 1<sup>st</sup> Para., Lines 9-12), and providing a fourth set of modules (Sec. 2.2, 1<sup>st</sup> Para., Lines 9-12 – object code) having third intermediate representations optimized (Sec. 2.2, 1<sup>st</sup> Para., Lines 9-11 – ucode; 2<sup>nd</sup> Para. - optimization) from the second intermediate representations (Sec. 2.1, 1<sup>st</sup> Para., Lines 1-3 – IR – Internal Representation).

6. **As to claim 15**, Ayers discloses a computer-readable medium embodying a compiler, the compiler comprising: a front-end phase (Fig. 1 (bottom), element – Front End); a cross-module analysis phase (Fig. 1 (bottom), element – Inter-procedural Optimization); and a back-end phase (Fig. (bottom), element – Per-Routine Optimization); wherein the front-end phase invokes the cross-module analysis phase (Sec. 2, 1<sup>st</sup> Para., Lines 1-4; Fig. 1 (bottom), element - Sources) ; the cross-module analysis phase determines whether a callee is to be in-lined into a caller in the back-end phase (Fig. 4 - screen inline candidates & select inline sites; Sec. 2.4, 3<sup>rd</sup> Para., Lines 1-2, 5-17); provides instructions for the back-end phase to transform in-lining code of the callee (Sec. 2.2, 1<sup>st</sup> Para., Lines 9-12); and invokes the back-end phase (Sec. 2.1, 1<sup>st</sup> Para., Lines 4-8; and the back-end phase transforms the in-lining code based on the instructions (Sec. 2.2, 3<sup>rd</sup> Para., Lines 8-11).

7. **As to claim 2**, Ayers discloses the method wherein: the compiling process comprising a front-end phase (Fig. 1 (bottom), element – Front End), an inter-procedural analysis phase (Fig. 1 (bottom), element – Inter-procedural Optimization), and a back-end phase (Fig. (bottom), element – Per-Routine Optimization); the inter-procedural phase being the first phase (Sec. 2.2, 1<sup>st</sup> Para., Lines 1-4); and the back-end phase being the second phase (Sec. 2.2, 1<sup>st</sup> Para., Lines 9-12).

8. **As to claim 3**, Ayers discloses the method in the first phase of the compiling process, further having a third function in the module containing the second function (Sec. 2.4, 3<sup>rd</sup> Para., Lines 5-17).

9. **As to claim 4**, Ayers discloses the method in the second phase of the compiling process, further getting rid of the third function in the module containing the second function after using that third function to in-line its code into the second function (Sec. 3.2, 3<sup>rd</sup> Para., Lines 6-10).

10. **As to claim 5**, Ayers discloses the method wherein the third function being selected from a group (Sec. 1, 4<sup>th</sup> Para., Lines 1-3) consisting of the first function (Sec. 1, 2<sup>nd</sup> Para., Lines 1-3) and a clone of the first function (Sec. 1, 2<sup>nd</sup> Para., Lines 7-11).

11. **As to claim 6**, Ayers discloses the method wherein in the second phase of the compiling process, in-lining the code of the first function into the second function uses a clone of the first function (Sec. 2.3; Fig. 3).

12. **As to claim 7**, Ayers discloses the method wherein in the second phase of the compiling process, the code used to be in-lined into the second function is stored in a file (Sec. 2.1, 1<sup>st</sup> Para., Lines 8-15).

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13. **As to claim 8**, Ayers discloses the method wherein in the second phase of the compiling process, the code used to be in-lined into the second function is stored in a library (Sec. 3.1, 2<sup>nd</sup> Para., Lines 1-7).

14. **As to claim 9**, Ayers discloses the method wherein the instructions include at least a list of callees to be in-lined and corresponding callers (Sec. 1, 4<sup>th</sup> Para., Lines 7-13 – it can inline or clone calls both within and across program modules).

15. **As to claim 11**, Ayers discloses the method in the second phase, further using code in the module containing a function caller of a function callee to transform in-lining (Sec. 1, 2<sup>nd</sup> Para, Lines 1-3).

16. **As to claim 12**, Ayers discloses the method wherein the code being selected from a body of the function callee (Sec. 1, 2<sup>nd</sup> Para., Lines 1-3).

17. **As to claim 13**, Ayers discloses the method wherein the code being selected from a clone of the function callee (Sec. 1, 2<sup>nd</sup> Para., Lines 7-11).

18. **As to claim 14**, Ayers discloses the method wherein the instructions include at least one of: a set of function caller including at least one function caller (Fig. 4, Lines 3, 8); a set of function callee including at least one function callee (Sec. 2.4, 2<sup>nd</sup> Para., Line

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1-2); the order for transformation of in-lining (Sec. 2.4, 2<sup>nd</sup> Para., Lines 2-3; 3<sup>rd</sup> Para., Lines 1-2); the location of at least one function callee (Sec. 2.3, 6<sup>th</sup> Para., Lines 7-12); and decisions whether to keep a body of at least one function callee after in-lining transformation (Sec. 3.2, 3<sup>rd</sup> Para., Lines 6-10).

19. **As to claim 16**, Ayers discloses the computer-readable medium wherein the back-end phase further performs tasks related to in-lining (Sec. 2.2, 3<sup>rd</sup> Para., Lines 8-11).

20. **As to claim 17**, Ayers discloses the computer-readable medium wherein the tasks related to in-lining include at least deleting the callee in a module containing the caller (Sec. 3.2, 3<sup>rd</sup> Para., Lines 6-10).

21. **As to claim 18**, Ayers discloses the computer readable medium wherein transforming the in-lining code uses code of a clone of the callee (Sec. 1, 2<sup>nd</sup> Para., Lines 7-11).

22. **As to claim 19**, Ayers discloses the computer-readable medium wherein a call to the callee is in a module that does not include the callee (Sec. 1, 4<sup>th</sup> Para., Lines 7-13).

23. **As to claim 20**, Ayers discloses the computer-readable medium wherein the instructions include at least a list of callees (Sec. 2.4, 2<sup>nd</sup> Para., Line 1-2).



### **Conclusion**

24. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- M. L. Graham, Compiler With Intermediate Compiling Mechanism (Pat. No. 5,940,620).
- Bates et al., System For Partial In-Line Expansion Of Procedure Calls During Program Compilation (Pat. No. 5,701,489).

25. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ben C. Wang whose telephone number is 571-270-1240. The examiner can normally be reached on Monday - Friday, 8:00 a.m. - 5:00 p.m., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nabil El-Hady can be reached on 571-272-2333. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO

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Customer Service Representative or access to the automated information system, call

800-786-9199 (IN USA OR CANADA) or 571-272-1000.

BCW *BN*

December 28, 2006

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